

Causality Analysis of the Brent Oil Prices, the Gold Prices and the Exchange Rates (USD/IDR) on Indonesia Composite Index (Empirical Study January 2016 – April 2021)



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ABSTRACT: Global economic conditions are in turmoil due to the COVID-19 pandemic since 2019. Many policies are implemented to suppress the spread of the virus, which then has an impact on economic activity. It influences investors' attitudes and changes the choices in investing. This study aims to analyse the causal relationship between the Indonesia Composite Index (ICI) and gold prices, oil prices and the exchange rate (USD/IDR). This study used monthly data for the period January 2016 – April 2021 with an analysis of the Vector Error Correction Model (VECM), which is a restricted VAR model with the Eviews 10 tool. The long-term VECM estimation results show that Brent oil prices and gold prices have a negative effect while the exchange rate (USD/USD) IDR the ICI. The Granger causality test shows that the ICI has a one-way causality relationship with the exchange rate (USD/IDR).

KEYWORDS: Gold Price, Brent Oil Price, Exchange Rate (USD/IDR), ICI, Causality, VECM

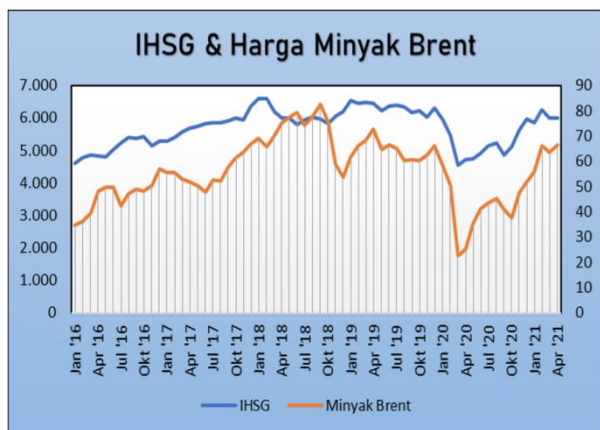
1. INTRODUCTION

The purpose of investment is to get profits in the future by allocating funds to real assets such as jewellery, precious metals, property and financial assets in the money market and the capital market. The Indonesia Composite Index (ICI) is a benchmark for determining the value of shares and a historical description of the price movements of the composite stock on the stock exchange which is the capital market in Indonesia as a place of investment as well as an important factor in the economy of a country.

The ICI value from January 2016 to December 2019 was quite volatile and tended to be stable, but since January 2020 there has been a drastic decline. The peaked of the decline is in March 2020. This condition was caused by the COVID-19 pandemic which began to enter Indonesia and created various policies from the government to recover public health, but it creates an impact on economic activities. Blanchard (2006) states that macroeconomic factors that can affect the capital market are the global economy, world energy levels and the political stability of a country. Another factor that affects the capital market is the behaviour of investors in investing. As stated by Gumanti (2007), investors tend to avoid risk by choosing investments with low risk compared to investments with high risk. By observing various aspects and factors that influence fluctuations in the capital market, this study found that world oil prices and gold prices as a mining commodity to exchange rates as exchange rates is a step to obtain information about the bad or the good signals as a consideration in investing.

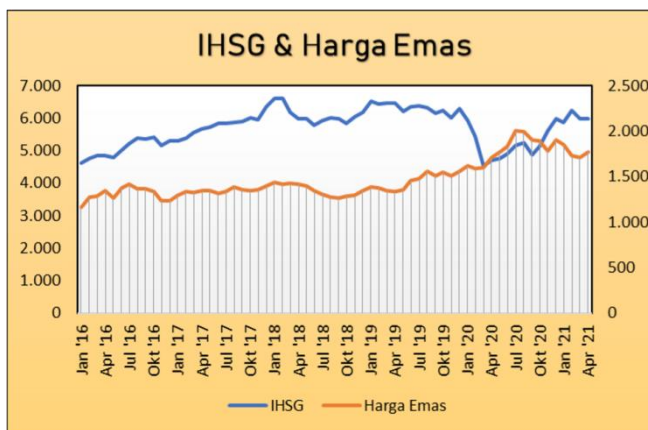
The following graph shows the movement of the ICI to Brent oil prices, gold prices and the exchange rate (USD/IDR) for the period January 2016 to April 2021. The decline in the ICI and Brent oil prices, the increase in gold prices and the exchange rate (USD/IDR) was very extreme. It happened due to the COVID-19 pandemic period in March and April 2020. The panic attack and uncertainty of the situation had an impact on economic conditions.

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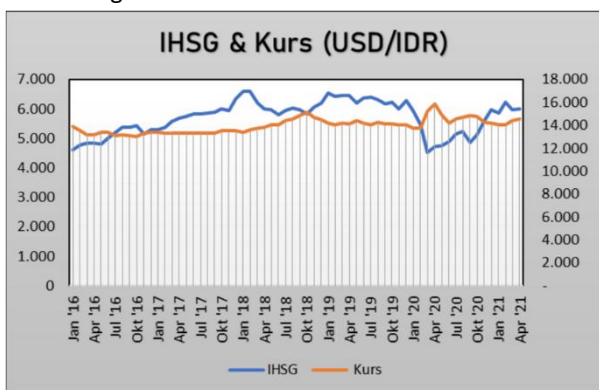
Picture 1. Graph ICI dan Brent Oil Price

Source: id.investing.com



Picture 2. Graph ICI dan Gold Price

Source: id.investing.com



Picture 3. Graph ICI dan Brent Oil Price

Source: id.investing.com & www.bi.go.id

2. LITERATUR REVIEW

The grand theory of this study is the theory about stock prices are influenced by information or issues that are developing, such as Asymmetric Information Theory, Signalling Theory dan Random Walk Theory.

2.1 Capital Market

The capital market is a professional institution related to buying and selling securities, in Indonesia known as the Indonesia Stock Exchange (IDX) with a stock price index as an indicator of stock price movements. The role of the capital market is important and it becomes a factor in the movement of the economy (Setyastuti, 2015).

2.2 Indonesia Composite Index (ICI)

ICI is historical information that is used as a benchmark for the combined performance of all stock prices listed on the stock exchange (Sunariyah, 2006). The movement of the ICI is influenced by various factors, including macroeconomics and the global economy. Macroeconomic conditions that affect the ICI movement are the inflation rate and the exchange rate, while global economic conditions that can affect the ICI are gold prices and world oil prices (Harfikawati, 2016). Investors do not like the condition where the stock price index has decreased because it can reduce profits (Tesa, 2012).

2.3 Brent Oil Price as World Oil

Brent blend is a type from northern Europe with extensive storage and markets around the world and is more widely used as an ingredient for making diesel fuel because of its higher sulphur so Brent oil is one of the benchmarks for world oil trade prices.

2.4 Golden Price

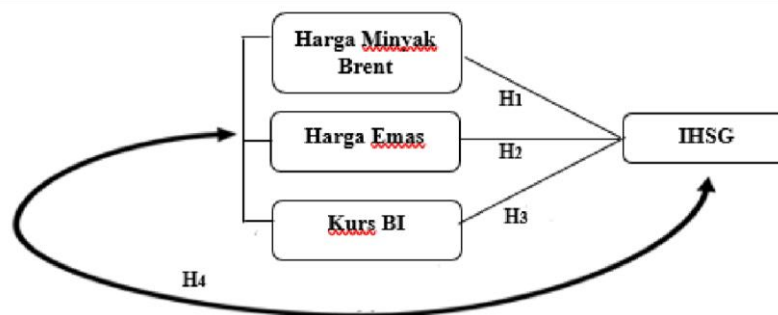
Gold is the real type of investment based on precious metals that can be formed into jewellery, coins and bars. Its tangible nature makes gold considered an alternative investment with low risk and tends to be safe. The process of determining world gold prices refers to supply and demand. Since 1968 the gold price that has been used as a benchmark is the gold price based on the London gold market, which is called the London Gold Fixing.

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2.5 Exchange Rate (USD/IDR)

The exchange rate is the amount of domestic currency needed to obtain one foreign currency value (Sukirno, 2002). When there is a strengthening of the rupiah exchange rate to the US dollar, the rupiah exchange rate to the US dollar is low, then it has an impact on stock prices (Muharam & Nuraini MS, 2008).

2.6 Framework



2.7 Research Hypothesis

Brent Oil Prices Affect the ICI in the Long Term

The stable world oil prices indicate stable global economic conditions, starting from the supply of oil and the demand for oil as fuel for both industry and vehicles. In these conditions, investors will have consideration to investing their funds in the capital market because it is considered a good signal in line with the theory by (Suwardjono, 2010). This condition is also in line with the theory presented by (Kowanda et al., 2015) commodities as a means of investment will affect the capital market. A previous study (Akua Miyanti & Wiagustini, 2018) states that world oil prices have a negative effect on the ICI on the Indonesian Stock exchange, this means that an increase in oil prices will result in a decrease in stock prices on the Indonesian Stock Exchange. H1: Brent oil price has an effect on ICI in the long term.

Gold Prices Affect the ICI in the Long Term

Gold is an alternative investment that is considered safe and risk-free (Sunariyah, 2011). Because gold is a tangible investment and can be worn as jewellery. In the initial situation of the COVID-19 pandemic where there was a panic attack due to the uncertainty of economic conditions because of various policies made concerned with public health. An investment shift also occurred, where the attitude of investors who tended to choose low-risk investments, resulted in an increase in gold prices and a decrease in the price of ICI in the capital market. A previous study by (Dwiati & Ambarwati, 2016) states that gold prices have a negative effect on the ICI, this means that an increase in gold prices will result in a decrease in the ICI. H2: The gold price has an effect on ICI in the long term

The exchange rate (USD/IDR) has an effect on the ICI in the long term

Global economic conditions often have an impact on the exchange rate of the rupiah to the dollar, it also has an impact on the attitude of investors in investing in the stock market. When the rupiah exchange rate begins to weaken, investors will consider their investment due to concerns about the developing global situation. Damajanti & Rosyati (2018) in their research states that the exchange rate of the rupiah to the dollar affected the ICI. H3: Exchange rate (USD/IDR) has an effect on JCI in the long term

ICI shows a causal relationship to Brent oil prices, gold prices and the exchange rate (USD/IDR)

Certain economic conditions lead to various economic activities such as demand for commodities or the policies that aimed to stabilize certain situations so that it influences the attitude of investors in allocating investments. Dimitrova (2005) states that there are several important reasons that it is necessary to build a relationship between stocks and exchange rates, including monetary and fiscal policies, prediction of exchange rate paths, managing currency as an asset in an investment portfolio and forecasting crises. This can explain the relationship between the ICI and the exchange rate. When the rupiah depreciates by US\$, it is a sign that economic conditions are not doing well. Then investors will mitigate risk by diverting their investment to low-risk investments, like gold. The investment shift will cause the gold price to rise while the ICI falls. Other commodities, such as the price of Brent oil as a source of fuel energy, will also be affected due to the decline in production so the demand for Brent oil also decreases, followed by a decline in the ICI.

H4: JCI shows a causal relationship to Brent oil prices, gold prices and the exchange rate (USD/IDR)

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3. RESEARCH METHODS

This study uses monthly data for the period January 2016 to April 2021 with ICI as the independent variable, then Brent oil prices, gold prices and the exchange rate (USD/IDR) as dependent variables. Thus the number of samples for each variable is 64. The approach used is descriptive and inferential which is expected to be able to provide information and draw conclusions to explain the relationship between the independent and dependent variables. The analysis technique used is Vector Autoregressive (VAR) or Vector Error Correction Model (VECM). The VAR method will be used when the data is stationary at the level or does not have cointegration. The VECM method will be used when the data is stationary at the first difference or second difference level together and has a cointegration relationship.

The general specifications of the VAR model are as follows:

$$X_t = A_0X_{t-1} + A_1X_{t-2} + \dots + A_pX_{t-p} + \epsilon_t$$

Notes:

- X_t : vector size $n \times 1$ which contains n variables that enter into the VAR model
- A_0 : the intercept vector size $n \times 1$
- A_1 : coefficient matrix size $n \times n$
- ϵ_t : residual vector size $n \times 1$

The general specifications of the VECM model are as follows:

$$\Delta y_t = \mu_0 + \mu_1 t + \pi_t y_{t-1} + \sum_{i=1}^{k-1} \Gamma_{ix} \Delta y_{t-1} + \epsilon_t$$

Notes:

- Δy_t : vector containing the variables in the study
- μ_0 : vector intercept $\mu_1 t$: regression coefficient vector t : time trend
- π : $\alpha\beta'$ where β' contains the long-run cointegration equation
- y_{t-1} : in-level variable
- Γ_{ix} : regression coefficient matrix
- ϵ_t : error term

4. RESULT AND DISCUSSION

4.1 Result

Data stationarity Test Results

Uji Augmented Dickey-Fuller Unit Root Test			
Variabel	Critical values (α)	Level	1 st - Difference
		Prob	Prob
IHSG	5%	0,1778	0,0000
Harga Emas	5%	0,6420	0,0000
Harga Minyak Brent	5%	0,0380	0,0000
Kurs Tengah BI	5%	0,5040	0,0000

Source: E-views 10 (compiled by the researcher)

Stationarity test using Augmented Dickey-Fuller (ADF) or unit root test with a critical value of 5%, so that when the t-statistic < from the critical value (α) then the variable is stationary. The results from the table show that all variables are stationary at the first difference level with a p-value of 0.000.

Lag Optimum Determination

Lag	LogL	LR	FPE	AIC	SC	HQ
0	411.9705	NA	9.13 e-12	-14.06795	-13.92585*	-14.01260*
1	428.4579	30.13209	8.99e-12	-14.08475	-13.37426	-13.80800
2	445.1717	28.24057*	8.85e-12*	-14.10937*	-12.83047	-13.61121

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3	459.5510	22.31274	9.55e-12	-14.05348	-12.20619	-13.33393
4	476.7679	24.34112	9.53e-12	-14.09545	-11.67975	-13.15448
5	485.9451	11.70888	1.29e-11	-13.86018	-10.87609	-12.69781

Source: E-views 10 (compiled by the researcher)

Determination of the optimum lag aims to determine the time needed by a variable to respond to changes in other variables. Based on the information table for the most stars and the smallest AIC, it is at lag 2, so it is necessary to do a VAR Stability Check test to determine the stability of the model.

Root	Modulus
	0.652505
-0.022630 - 0.652113 i	
-0.022630 + 0.652113i	0.652505
0.202826 - 0.511627i	0.550364
0.202826 + 0.511627i	0.550364
0.517644	0.517644
-0.198900 - 0.121254i	0.232946
-0.198900 + 0.121254i	0.232946
-0.004208	0.004208

Source: E-views 10 (compiled by the researcher)

The VAR Stability Check test results show the modulus value < 1, then the model is stable and the recommended optimum lag is lag 2.

Cointegration Test

The cointegration test is the difference between the VAR and VECM models. In the VECM model, the variables must have cointegration by doing the Johansen Cointegration Test (Gujarati & Porter, 2006)

Hasil Uji Kointegrasi			
Unrestricted Cointegration Rank Test (Trace)			
H0	Trace Statistic	Critical Value 0, 05	Prob.**
None*	56,38461	54,0790	0,0307
At most 1	23,59132	35,1928	0,4893
At most 2	8,821378	20,2618	0,7528
At most 3	28,88485	9,1645	0,6017

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
H0	Max-Eigen Statistic	Critical Value 0, 05	Prob.**
None*	32,79329	28,58808	0,0136
At most 1	14,76994	22,29962	0,3942
At most 2	5,932893	15,89210	0,7954
At most 3	2,888485	9,164546	0,6017

Source: E-views 10 (compiled by the researcher)

The Johansen test was conducted by comparing the value of the trace statistic and the max-eigen statistic > critical value with a significance level of 5%. The cointegration test results in the table show that there is 1 cointegration with a trace statistic value of 56.38461 > critical value 54.0790 and a max-eigen statistic value of 32.79329 > critical value 28.58808, so the model that will be used in this study is Vector Error Correction. Models (VECM).

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Vector Error Correction Model (VECM) Estimation Model

The Vector Error Correction Model (VECM) is a restricted VAR model and has a cointegration relationship. The results of the cointegration test show that there is 1 cointegration, so the VECM model is feasible to use with the "Linear intercept no trend" specification. The VECM model will show the long-term and short-term relationships that are owned by variables to other variables. In this VECM estimate, the ICI becomes an endogenous variable, while Brent oil prices, gold prices and the exchange rate (USD/IDR) become exogenous variables with a table value of 2,0003. T-table is obtained from the significance level used is 5% and the degree of freedom (df) = 60, the total data minus the number of variables. The results of the long-term relationship VECM are described as follows:

Variabel	Koefisien	t-statistik
Harga Minyak Brent (1)	-0,665509	[-11,1108]
Harga Emas (1)	-0,576954	[-4,54621]
Kurs (USD/IDR) (1)	1,311002	[3,55783]
C	-14,28627	

Source: E-views 10 (compiled by the researcher)

The results of the long-term VECM estimation based on the table show the following equation:

$$\text{IHSG} = -0,665509 \text{ Harga Minyak Brent}_{t-1} - 0,576954 \text{ Harga Emas}_{t-1} + 1,311022 \text{ Kurs (USD/IDR)}_{t-1} - 14,28627$$

$$\text{ICI} = -0,665509 \text{ Brent Oil Price}_{t-1} - 0,576954 \text{ Gold Price}_{t-1} + 1,311022 \text{ Exchange Rate (USD/IDR)}_{t-1} - 14,28627$$

VECM estimation result is considered significant if the t-statistical value > t-table = 2,0003. So it can be explained that:

1. The Brent oil price has a negative effect on the ICI movement, which means that if there is an increase in the price of Brent oil by 1 unit, it will cause a decrease in the ICI movement of 0.665509 units.
2. The gold price has a negative effect on the ICI movement, which means that if there is an increase in the price of gold by 1 unit, it will cause a decrease in the ICI movement of 0.576954 units.
3. The exchange rate (USD/IDR) has a positive effect on the ICI movement, which means that if there is an increase in the exchange rate (USD/IDR) by 1 unit, it will cause an increase in the ICI movement of 1.311002 units.

Granger Causality Test

A granger causality test was conducted to see the causality between variables. If the p-value < 5%, then the variable has an influence on other variables and when the other variables are juxtaposed to produce a p-value < 5%, then there is causality or a causal relationship between the two variables.

Kelambanan pada Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
HARGA_MINYAK_BRENT does not Granger Cause IHSG	62	0.51482	0.6004
IHSG does not Granger Cause HARGA_MINYAK_BRENT	62	2.23820	0.1159
HARGA_EMAS does not Granger Cause IHSG	62	0.38510	0.6821
IHSG does not Granger Cause HARGA_EMAS	62	0.76199	0.4714
IHSG does not Granger Cause KURS	62	0.57149	0.5679
KURS does not Granger Cause IHSG	62	7.03636	0.0019

Sumber: E-views 10 (diolah peneliti)

The results of the Granger causality test in the table show that only the ICI against the exchange rate (USD/IDR) has a p-value of 0.0019 < 0.05, so it can be interpreted that there is a one-way causality relationship, the ICI that affects the exchange rate (USD/IDR) but not the other way around.

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4.2 Discussion

Brent Oil prices affect the ICI in the long term

The results of the long-term VECM estimation test show that the Brent oil price has a negative effect on the ICI movement,

which means that if there is an increase in Brent oil price by 1 unit, it will cause a decrease in the ICI movement of 0.6655 units. These results are in line with conditions when an increase in the Brent oil price in the long term will cause investors' anxiety about inflation so that there is a possibility that a stock sell-off will be done, thus having an impact on the decline in stock values and the ICI. These results are by the first hypothesis and support previous research conducted by (Akua Miyanti & Wiagustini, 2018) and (Kowanda et al., 2015) which states that world oil prices are one of indication which can affect the capital market.

Gold Price affect the ICI in the long term

The results of the long-term VECM estimation test show that the gold price has a negative effect on the ICI movement, which means that if there is an increase in the gold price by 1 unit, it will cause a decrease in the ICI movement of 0.5769 units. When economic conditions are being unstable due to the COVID-19 pandemic and have a bad impact on other types of investment, there is a shift in investment and gold is become the alternative of investment because it is tangible so it is considered minimal risk. This condition causes the gold price to have a negative effect on the ICI. These results are by the first hypothesis and support previous research conducted by (Dwiati & Ambarwati, 2016).

The exchange rate (USD/IDR) affect the ICI in the long term

The results of the long-term VECM estimation test show that the exchange rate (USD/IDR) has a positive effect on the ICI movement, which means that if there is an increase in the exchange rate (USD/IDR) by 1 unit, it will cause an increase in the ICI movement of 1.3110 units. When the currency depreciates, it will have an impact on trading activities from or abroad which have an impact on the cost and value of the company. This condition is a consideration for investors to invest or withdraw investment, this is what makes the exchange rate (USD/IDR) affect the ICI. These results are by the first hypothesis and support the previous research conducted by (Luh et al., 2020).

ICI has a causal relationship to Brent oil price, the gold price and the exchange rate (USD/IDR)

The results of the granger test from this study show that there is a one-way causality between the ICI and the exchange rate (USD/IDR) which is in line with previous research conducted by (Natsir et al., 2019). This can be interpreted as the rise and fall of the ICI will affect the movement of the exchange rate (USD/IDR). When the ICI experiences a decline, the exchange rate (USD/IDR) will depreciate. This condition is the impact of investors selling shares when the stock price continues to fall, the exchange rate (USD/IDR) will appreciate. However, this does not happen in the opposite situation.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The VECM model in this study shows that the Brent oil price, the gold price and the exchange rate (USD/IDR) as macroeconomic variables have a long-term influence on the ICI. Where the Brent oil price and the gold prices have a negative effect on the ICI movement, while the exchange rate (USD/IDR) has a positive effect on the ICI. The relationship between Brent oil prices, gold prices and the exchange rate (USD/IDR) with the ICI based on the Granger causality test show that there is only a oneway causality relationship between the ICI and the exchange rate (USD/IDR), so the rise and fall of the ICI will affect the exchange rate (USD/IDR). IDR) but this does not happen in the opposite condition

5.2 Recommendation

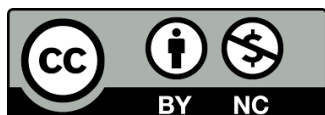
Based on the results of the previous study and this study, some suggestions can be considered to improve further research:

1. The COVID-19 pandemic has an unpredictable impact on the economic situation; however, investors can use macroeconomic variables such as Brent oil price, gold price and exchange rate (USD/IDR) as tools to analyze the ICI in the long term which stated in this study.
2. The monetary policy authorities of Bank Indonesia and the Financial Services Authority need to pay more attention and anticipate the impact of changes in the Brent oil price, the gold price and the exchange rate (USD/IDR) on ICI movements.
3. Further researchers are advised to compare the period before the COVID-19 pandemic with the time when the COVID19 pandemic occurred with a balanced period and add a foreign stock index variable to see the causality of capital markets abroad with domestic.

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